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Keywords: profound intellectual and multiple disabilities; peer interactions; peer directed behaviours; staff behaviour; social scaffolding; peer relationships

Abstract

Background The multiple and complex disabilities of persons with profound intellectual and multiple disabilities (PIMD) form a barrier for peer interactions and peer directed behaviours. In this study we further explore the nature of peer directed behaviours in persons with PIMD and its relationship with social scaffolding behaviour of direct support workers (DSW).

Methods Fourteen dyads of children with PIMD, who knew each other for at least 12 months, participated. They were sitting in close proximity while they were filmed with and without the presence of the DSW. Video recordings were coded continuously making use of observation schemes for the peer directed behaviours of the children and the peer interaction influencing behaviours of the DSW.

Results Significantly more singular peer directed behaviour (without DSW: 18.00%; with DSW: 3.81%) was observed than multiple peer directed behaviour (without DSW: 4.01%; with DSW: 0.52%). The amount of time the singular and multiple peer directed behaviours were observed was significantly lower in the presence of a DSW. When the DSW show peer interaction influencing behaviour it was mostly social scaffolding behaviour (2.17%). The conditional probability of observing social scaffolding behaviour in the 10 seconds following on singular peer directed behaviour was .02 with a Yule's Q of .04 and following on multiple peer directed behaviour .04 with a Yule's Q of .33.

Conclusion The way in which peer interactions in children with PIMD are defined could have an impact on the amount of observed peer directed behaviours and on the effect of the social scaffolding behaviours presented by DSW.

Introduction

The ability to interact with peers or to present peer directed behaviours depends on various child characteristics such as age, temperament, and disabilities (e.g. Brown et al. 2001; Girolametto et al. 2004; Guralnick 1999). It can be assumed that the impairments of children with profound intellectual and multiple disabilities (PIMD) substantially affect their peer interactions. Their profound cognitive disability makes the understanding of social cues and verbal and symbolic language difficult (Petry & Maes 2007). Children with PIMD communicate by means of body movements, muscle tension, vocalisations, and other subtle signals (Hostyn & Maes 2009). This communication on a pre- or protosymbolic level impedes expressing their needs and being understood by others (Grove et al. 1999; Olsson 2004; Porter et al. 2001). Their profound neuromotor dysfunctions hinder the occurrence of social behaviours, such as waving, smiling, or pointing (Houwen et al. 2014; McEwen 1992; van der Putten et al. 2005). Often persons with PIMD have sensory impairments which may disturb the potential to initiate interactions or to attract the attention of others (Brown et al. 2001; Girolametto et al. 2004; Guralnick 1999). Children with auditory impairments interact less frequently with peers compared to hearing children (Antia & Kreimeyer 2003). Visual impairments impede the recognition of visual cues which play a role in the development of social competences (Sacks & Silberman 2000; Zebehazy & Smith 2011).

Despite these difficulties, parents and direct support worker (DSW) identify interpersonal relationships as a key dimension of the quality of life in persons with PIMD (Petry et al. 2005). For the broader group of persons with intellectual disabilities it has been demonstrated that relationships with peers and friends are important for their subjective well-being, their mental and physical health, and their quality of life (Garvey & Kroese 1991; Knox & Hickson 2001; Schalock & Verdugo 2002). A greater risk of loneliness and depression was found in absence of peer acceptance and friendships (Garvey & Kroese 1991).

Research on peer interactions in persons with PIMD has mostly focused on peer interactions with typically developing peers neglecting their interactions in educational, residential and day facilities with peers with PIMD (Nijs & Maes 2014). Peer interactions of persons with PIMD are variously described (Nijs & Maes 2014) as: directly observable behaviours (Brady et al. 1991; Hanline 1993; Logan et al. 1998; Nijs et al. 2014), dyadic interactions (Hunt et al. 1996; Lancioni et al. 2002), or behaviours needed to interact with peers (Anderson & Brady 1993; Foreman et al. 2004). In the general developmental literature a social interaction is defined as a dyadic, mutually rewarding activity which takes one or several turns in which the interaction partner is the focus (Beauchamp & Anderson 2010). Various observable social behaviours are shown during interactions (Hartup 2009; Rubin et al. 1998; Williams et al. 2010b).

Gleason (1990) described a situation in which two boys with PIMD played together which reveales the richness of their abilities to play together. Reciprocity between the children was observed, they exchanged an object. He argued that it could be that the conceptual framework which was held to look at what they did hindered DSW in their observation of these interactions. Gleason (1990) concluded, that DSW did not recognise the mutual interactions between the two boys with PIMD. Because of this misinterpretation of the social interactions DSW might terminate ongoing interactions. In the study of Nijs et al. (2014), peer interactions among persons with PIMD during group activities were observed. Children with PIMD showed behaviours directed towards their peers with PIMD in 8.14% of the time. In only 2.63% of the time these were peer directed behaviours as they are defined in the general literature, as a combination of looking or directing at the peer and a social behaviour, the multiple peer directed behaviours (Mueller & Brenner 1977; Williams et al. 2010a). Singular peer directed behaviours in which this combination of behaviours was not present were observed during 5.51% of the time (Nijs et al. 2014). In this study we want to explore further how persons with PIMD present peer directed behaviours. We will examine if there is a sequential relationship

between the singular and multiple peer directed behaviours and if mutual interactions between children with PIMD can be observed.

Besides child characteristics, teachers and DSW may influence peer interactions among persons with PIMD by presenting social scaffolding behaviour (Rubin et al. 1999; Williams et al. 2010a). Adults can use scaffolding strategies to guide young children to solve problems and complete tasks that are beyond their ability level (Vygotsky 1978; Wood et al. 1976). Social scaffolding strategies are a specific category of the general scaffolding strategies and are used to guide and help young children during social experiences with peers (Williams et al. 2010a). With regard to peer interactions in children with PIMD, it has been demonstrated in earlier research (Hunt et al. 1996; Logan et al. 1998) that when both adults and peers with or without PIMD are present, more interactions between the child with PIMD and the adult were observed compared to peer interactions. During group activities, the DSW presented social scaffolding behaviour only 4.44% of the time behaviours and 0.71% of the time they disrupted peer interactions among children with PIMD (Nijs et al. 2014). The DSW did not provide optimal positioning for persons with PIMD in order to facilitate peer directed behaviours (Nijs et al. 2014). In this study we will investigate if children with PIMD present more peer directed behaviours in the presence or absence of the DSW. We will analyse if DSW present more social scaffolding behaviours following on multiple peer directed behaviours compared to singular peer directed behaviours, because only the multiple peer directed behaviours are in general considered as peer directed behaviours and are more readily recognised as peer directed behaviours. Finally, we will investigate if social scaffolding behaviours are associated with higher levels of peer directed behaviours in children with PIMD.

Method

Participants

Several schools and facilities for children with PIMD in Flanders, the Dutch speaking region in Belgium, and the Netherlands were contacted by e-mail and phone and asked for their participation in our study. Three facilities in the Netherlands and seven in Flanders were willing to participate and selected participants with PIMD (Nakken & Vlaskamp 2007) based on the following inclusion and exclusion criteria: (1) having a profound intellectual disability, (2) having severe motor disabilities, (3) aged between four and 18 years, (4) the peers who form the dyad have known each other for at least 12 months, (5) having no diagnosis of autism. We have chosen to not include persons with a diagnosis of autism because of their specific difficulties regarding social relationships and interactions.

The research group consisted of 14 dyads of children with PIMD. Twenty two Belgian children and six Dutch children aged between four years seven months and 18 years one month participated (M = 11 years 4 months; SD = 42.42 months). Based on the personal records is known that all children were considered as having PIMD but the developmental level was formally assessed using the Bayley Scales of Infant Development or the Kent Infant Development Scale for only twelve participants and varied between two and 24 months. . They all had severe motor disabilities and were not independently mobile. Eleven had visual disabilities and one was blind. Three had auditory impairments. More detailed information is presented in table 1.

For every dyad a DSW who had known the children for at least six months was selected. All 14 participating DSW were female, aged between 23 years ten months and 58 years two months. Five had a degree in vocational education, seven had a bachelor's degree, and two a master's degree, all in the pedagogical field. They all had several years of experience in working with persons with PIMD (M = 15 years, SD = 10.05 years). The DSW were informed about the focus of this study, investigating peer interactions of children with PIMD, but no detailed information on focus behaviours was given.

The participating DSW and the parents or legal representatives of the children were informed about the nature of the study, the anonymity, and the confidentiality of the obtained data and gave their written consent. The observation study was performed in coherence with the standards of the university ethical committee who reviewed and approved this study.

< Please insert Table 1 about here >

Procedure

The DSW were asked to fill in a communication profile which was based on three scales of the Inventarisatielijst Kindkenmerken (Tadema & Vlaskamp 2004) for persons with PIMD: (1) the active directed behaviour on the environment and possibilities to recognise and react to events and sounds in the environment; (2) the expression of basic communicative behaviours; (3) the behaviour directed to others, searching for contact, and reacting on contact. The Inventarisatielijst Kindkenmerken is a reliable instrument with a very good internal consistency ($\alpha = .93$) (Tadema & Vlaskamp 2004).

The dyads of children with PIMD were filmed in a room which they were familiar with in presence and in absence of the DSW. No other persons were present in the room. The dyads of persons with PIMD were observed in absence of the DSW for two periods of ten minutes. No materials were provided, but some children had a toy or object because these were always attached to their wheelchair. The researcher and the DSW observed outside the room via video screening to avoid distraction and for safety reasons. Before the DSW left the room he/she made the children with PIMD aware of the presence of the other for example by telling them that there is someone else near to them or by letting them feel each other. We do not know if every person with PIMD was able to understand this explanation. Although, in daily practice DSWs usually explain what they are going to do. By letting them physically touch each other this message was supported by more tactile information. After the first ten minutes the DSW re-entered the room and if necessary, reassured the persons with PIMD. During this observation

the children with PIMD were sitting in proximity of and facing each other, so they could see and touch, if physically possible, their peer. When the dyads were filmed together with a DSW, the DSW was asked to provide an activity for both children with PIMD together for 15 minutes. The children were familiar with these activities such as music activities or multisensory storytelling. The DSW could choose how to position the children with PIMD. They all placed them next to each other in their wheelchairs.

In order to make reliable observations and to get a comprehensive and complete view in both situations, two cameras were used to make the video recording. It depended on the availability of the DSW if the dyads were first filmed with or without the presence of the DSW, so no randomisation of this variable could be realized. In both conditions the DSW could stop the observation at any time.

Coding

The video fragments were coded continuously by three independent observers using the software program The Observer XT 10.5. A training was set up by the first author. The coding schemes have already been applied in earlier research (Nijs et al. 2014). Minor adjustments in the coding schemes were made by refining the nature of the peer directed behaviour by making the distinctions between the codes clearer and including more concrete behaviours.

The coding scheme for the children with PIMD (table 3) consists of three main categories. First, multiple peer directed behaviours which are defined as the child looking at or turning his head or body in the direction of the peer in combination with other behaviour. Other combinations of behaviours such as touching the peer and vocalising are also defined as multiple peer directed behaviours and can be found under the code ‘combination’. Second, singular peer directed behaviour is coded when the child looks at the peer or shows a social behaviour. No coordinated look at the peer in combination with another action is observed. For

both singular and multiple peer directed behaviours several modalities are coded. Singular peer directed behaviours are included to not only focus on combined behaviours in which a clear (visual or physical) directedness or orientation on the peer can be observed in combination with another social behaviour. The profound disabilities may impede the visual or physical directedness or orientation on the peer, in particular in combination with another behaviour. Third, 'other behaviour' captures all behaviours of children with PIMD when they are not directed towards the peer. All codes are mutually exclusive. Individual communication profiles of the participants with PIMD were consulted during coding.

< Please insert Table 2 about here >

The coding scheme for the behaviour of the DSW table 3) consists of three main categories. The first category, social scaffolding behaviour, refers to behaviour of the DSW with which they provide direct support, guidance, and feedback during peer interactions. The second category is used to code behaviours which distract the peers from interacting. The third category reflects all other behaviours such as organising the activity or interacting one-on-one with one child. All codes are mutually exclusive.

< Please insert Table 3 about here >

Interobserver agreement

Because of the large number of codes and the non-use of several codes in both coding schemes the exact agreement was calculated for the total coding scheme and the Cohen's Kappa for the three main categories using a time window of three seconds for the three main groups.

Two independent observers double coded 33.24% of the total observation time by use of the coding scheme for the child behaviour. The exact agreement for the coding scheme with all 21 codes was 72%, which is considered as satisfactory (Kazdin 1977). A substantial Kappa coefficient of .72 was obtained (Landis & Koch 1977).

For the coding scheme of the DSW' behaviour 26.73% of the total observation time was double coded by two independent observers. The exact agreement for all 17 codes of the coding scheme was 89%, which is satisfactory (Kazdin 1977). The Kappa coefficient of .70 displays a substantial agreement for the three main categories (Landis & Koch 1977).

Analysis

DSW were asked to organise an activity for about 15 minutes. Most of these activities were shorter in time. None of the observations of the persons with PIMD in absence of a direct support worker had to be stopped. Sometimes these observations were interrupted due to for example the sound alarm of the nutrition probe which may have increased the total observation time. The average duration of the video fragments without DSW was 23 minutes and 28 seconds and for the fragments with the DSW 13 minutes and 46 seconds. The observations did not have the exact same duration, therefore we first adjusted the codes for each participant for the total observation duration. For every participant the number of seconds a certain code was allocated was divided by the total time the participant was observed and multiplied by 100. This was calculated using the software package The Observer XT 10.1. The output was imported in the software package SPSS statistics 18 for the descriptive and inferential statistics. The data were not normally distributed, therefore the comparison between behaviours and situations was done by a Wilcoxon signed rank test.

Time window sequential analyses were done by use of the software package GSEQ 5.1 (Bakeman & Quera 2011). The conditional probabilities were calculated to indicate the likelihood the target behaviour would appear subsequent to the given behaviour. Afterwards the Yule's Q, an index of effect size varying from -1 to +1, was calculated. A Yule's Q value of zero indicates no association, +1 indicates a perfect positive association, and -1 a perfect negative association. An absolute value under 0.24 represents no association, an absolute value

between 0.25 and 0.49 a weak association, between 0.50 and 0.74 a moderate association and higher than 0.75 a strong association (Bakeman & Quera 2011).

Due to the low amount of the social scaffolding behaviour, conducting reliable time window sequential analyses to investigate the effect on the peer directed behaviours was impossible. Qualitative analyses were done by marking sequences in which peer directed behaviours were observed during or ten seconds after social scaffolding behaviours using the visualisation technique in The Observer XT 10.1. The behaviour of the DSW and of the two children were described in depth for every sequence.

Results

Peer directed behaviours of children with PIMD

Research question 1: Do children with PIMD show more singular peer directed behaviours compared to multiple peer directed behaviours?

Table 4 provides an overview of the mean percentages of time a certain child behaviour was observed together with its standard deviation. The children with PIMD predominantly presented non-peer directed behaviour (without DSW: 77.99%; with DSW: 95.66%). The amount of time during which singular peer directed behaviour (without DSW: 18.00%; with DSW: 3.81%) was observed was significantly higher (without DSW: z= -4.04, p <.05, r = -0.54; with DSW: z= -3.86, p <.05, r = -0.52) than the amount of time during which multiple peer directed behaviour (without DSW: 4.01%; with DSW: 0.52%) was observed.

Within the category of singular peer directed behaviour, the code ‘looking at the peer’ was the most commonly observed behaviour (without DSW: 14.04%; with DSW: 3.52%). The combination code in the multiple peer directed behaviours was only observed for 0.35% of time in absence of the DSW. The most observed multiple peer directed behaviour was looking or directing at the peer combined with touching the peer (without DSW: 2.17%; with DSW:

0.31%). For many codes high standard deviations were found. This large variation may be explained by the various child characteristics, especially the variations in their (dis)abilities.

< Please insert Table 4 about here >

Research question 2: Do children with PIMD present more multiple peer directed behaviour in the ten seconds following on singular peer directed behaviour?

The peer directed behaviours when the DSW was not present, were investigated more in depth. We investigated if the peer directed behaviour builds up from the more basic singular to the more complex multiple peer directed behaviour. A ten second interval was used this appeared to be a suitable compromise between a too-short and a too-long interval length (Engel, 1996). This way, we also took the delayed information processing of persons with PIMD into account. The conditional probability was .08 with a Yule's Q of .59 which indicates a moderate association of observing multiple peer directed behaviour in the 10 seconds after singular peer directed behaviour. The likelihood of observing multiple peer directed behaviour after singular peer directed behaviour decreases as time progresses (table 6).

In the general developmental literature peer directed behaviours are defined as looking or directing the head or the body at the peer combined with another social behaviour. We investigated to what extent the code 'looking at the peer' precedes multiple peer directed behaviour. A weak association (conditional probability = .06; Yule's Q = .37) was found for observing multiple peer directed behaviour in the 10 seconds following the code 'looking at the peer'. Again a decrease in conditional probability and Yule's Q is observed as time progresses (table 6).

< Please insert Table 5 about here >

Research question 3: Do children with PIMD show mutual interactions?

The conditional probability of observing peer directed behaviour of one child with PIMD in the 10 seconds following on peer directed behaviour of the other child with PIMD was 0.25 with a Yule's Q of .15. This indicates that there was no association between the peer directed behaviours of both children in our observations.

Role and peer interaction influencing behaviour of the DSW

Research question 1: Do children with PIMD present more peer directed behaviours when the DSW is not present?

Table 4 provides the differences in the mean percentages of time a certain child behaviour was observed with or without the presence of a DSW, together with the value of the Wilcoxon signed rank test and the effect size.

Although the children with PIMD predominantly presented non-peer directed behaviour, there is nevertheless a significant difference of 17.67% in the mean percentage of time this behaviour is presented with and without the presence of the DSW (z= -4.40, p <.05, r = -0.59). The amount of time the singular (3,81%) and multiple (0.52%) peer directed behaviours were observed when a DSW is present was significantly lower (z= -4.30, p <.05, r = -.57) (z= -3.84, p <.05, r = -.51) than the amount of time these behaviours were observed in absence of the DSW (18.00% and 4.01%). Within the category of singular peer directed behaviour, looking at the peer, vocalizations, facial expressions, and touching the peer were significantly less observed when the DSW was present. Multiple peer directed behaviours that were significantly less observed in the presence of the DSW were the combination of looking or turning at the peer and touching, vocalizations, facial expressions, or other combinations. The only peer directed behaviour that was observed more in presence of the DSW was the object related singular and multiple peer directed behaviour, although the differences were not significant.

Research question 2: Do DSW present more social scaffolding behaviours following on multiple peer directed behaviours compared to singular peer directed behaviours?

The behaviour of the DSW (table 7) was most of the time not related to the peer directed behaviours of the children with PIMD (97.13%). Social scaffolding behaviour was observed in 2.17% of the time. They used a whole range of social scaffolding behaviours from talking about the peer to bringing the peers into each other's proximity. Distracting behaviour was observed in 0.71% of the time.

< Please insert Table 6 about here >

The conditional probability of observing social scaffolding behaviour in the 10 seconds following on singular peer directed behaviour was .02 with a Yule's Q of .04, which indicates no association. The conditional probability of observing social scaffolding behaviour in the 10 seconds following on multiple peer directed behaviour was .04 with a Yule's Q of .33 which indicates a weak association.

Research question 3: Are social scaffolding behaviours associated with higher levels of peer directed behaviours in the child with PIMD?

In total 52 occurrences of social scaffolding behaviour were observed. In 15 sequences peer directed behaviour was observed during and/or up to ten seconds after the social scaffolding behaviour and a link between these behaviours was observed. If the social scaffolding behaviour was observed within 10 seconds of the end of the previous sequence of social scaffolding behaviour this was seen as one sequence. Taking this into account the 15 sequences were reduced to seven sequences.

A distinction between verbal and physical social scaffolding can be made. In three of the sequences the DSW presented verbal social scaffolding behaviour. They talked to one child

about the peer, for example after singing for the child the DSW asked: “shall we go to An now?, did you see who is smiling?” or after the DSW has built a tower with blocks for the peer she said “look, now I will build a tower for Ben.” In the four other sequences the DSW used physical social scaffolding behaviour. In most of these sequences this physical social scaffolding behaviour was combined with verbal encouragements. For example, the DSW moved the wheelchairs so the children were no longer sitting next to each other but facing each other so they could see their peer. Another DSW provided one object, a spider toy and held this in the middle between the two children so they got the opportunity to play together with this object.

Discussion

The first aim of this study was to get better insight in how children with PIMD present peer directed behaviours. Significantly more singular peer directed behaviours than multiple peer directed behaviours were observed. The profound intellectual and multiple disabilities form a barrier in presenting a coordinated look or direction at the peer in combination with a social action (Mueller & Brenner 1977; Williams et al., 2010a). Also the combination of other behaviours, such as touching and vocalising, was not often observed. It seems that the definition of peer directed behaviours in the general developmental literature is inappropriate for children with PIMD. In order to capture all their peer directed behaviours including singular peer directed behaviour is necessary. A high amount of the behaviour code ‘looking at the peer’ was observed. Based on the knowledge on peer directed behaviours in typically developing children this could be predicted because their earliest peer interactions are characterised by intense watching or looking at the peer (Brownell & Brown 1992; Rubin et al. 1998). Although, it is not clear if persons with PIMD follow this typical developmental trajectory.

Children with PIMD present more multiple peer directed behaviour in the ten seconds following on singular peer directed behaviour and more specifically on the code ‘looking at the peer’. It is plausible that the singular peer directed behaviours can lead into the more complex multiple peer directed behaviours or that the failure of a response by the interaction partner on the singular peer directed behaviour may elicit more complex behaviour in order to attract their attention.

Using the statistical analysis we could not observe mutual interactions. Perhaps by using more descriptive qualitative analyses we could have revealed some mutual interactions. A hypothetical explanation of these finding is that the initiations of one peer do not motivate or persist enough to elicit peer directed behaviours of the other peer. Previous research stated that persons with PIMD mostly respond to the initiations of their partners and do not often initiate interactions (Bruce & Vargas 2007; Hostyn et al. 2011). This study however shows the ability of children with PIMD to initiate peer directed behaviour.

The second aim of this study was to get insight in the role and the interaction influencing behaviours of the DSW, however few social scaffolding behaviours were observed. The presence of the support worker does not provide more opportunities or support for the children with PIMD to present peer directed behaviours. This result is in line with earlier research (Gleason 1990; Nijs et al. 2014).

Direct support workers present more social scaffolding behaviours following on multiple peer directed behaviours compared to singular peer directed behaviours. This might be because they do not consider singular peer directed behaviour as real peer interactions, and are only aware of the multiple peer directed behaviours, which are very limited in persons with PIMD. This result points to the necessity to sensitize the DSW to recognise singular and multiple peer directed behaviours in persons with PIMD and train them to present more social scaffolding behaviour towards their clients. We could not demonstrate how effective DSW are in evoking

peer directed behaviours in children with PIMD, due to the limited occurrences of sequences of social scaffolding behaviours. This association should be further investigated. Two forms of social scaffolding behaviours, verbal and physical behaviours, have been observed.

There are some limitations to our study. First, we intended to plan the observations at the same time of the day and to use a randomized order of the video observations with or without the DSW. However, we were depending on the day planning and rhythm of each dyad of children with PIMD, and on the availability of the DSW. Second, the low amount of social scaffolding behaviours and peer directed behaviours made it impossible to perform sequential analyses which would have yielded a better notion about which behaviours are best provided by the DSW to evoke peer directed behaviours. Third, in the coding scheme for the children with PIMD the code 'directed on the interaction between the support worker and the peer' is placed under 'other behaviour'. This code can probably contain behaviours which are also directed towards the peer. Considering this behaviour as peer directed behaviour however would have been an overestimation of the amount of peer directed behaviours. Fourth, as stated in the introduction, the positioning of persons with PIMD can influence the amount of presented peer directed behaviours (Nijs et al. 2014). In this study, we have chosen to position the participants in the same standardized way. Because the children with PIMD were observed alone in the room the safest way to position all children was sitting in their wheelchair. It can be argued that this is not the optimal positioning for enabling participants to be in contact with each other. In order to create peer interaction supportive positioning, persons with PIMD may need physical support from a DSW or appropriate equipment. Fifth, high standard deviations of the amount of peer directed behaviours may be explained by the variability in the impairments of the children with PIMD. In future research it would be interesting to focus more on the variability of the disabilities of the children with PIMD and its effect on the occurrence of peer directed behaviours. For example the influence of the visual disability and the motor disabilities

on the appearance of singular and multiple peer directed behaviour would be interesting to investigate. In this study however, we were not able to form equal and consistent groups and the focus behaviour was observed too infrequently to investigate the influence of the various disabilities.

The results of this study provided insight into the nature of peer directed behaviours of children with PIMD and in the role of the DSW. The definition of peer directed behaviours in children with PIMD needs to be adapted to their profound intellectual and multiple disabilities by including singular peer directed behaviours and not solely focusing on mutual interactions. By focusing solely on multiple peer directed behaviour DSW might miss opportunities for social scaffolding. It would be interesting to develop and implement an intervention program to guide DSW to provide a peer interaction supportive environment and to increase their social scaffolding behaviours.

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Table 1
Participant characteristics

Demographic variable	N	%
Gender		
Female	15	53.57
Male	13	46.43
Visual impairment		
Blind	1	3.57
Visual impairment	11	39.29
No visual impairment	16	57.14
Auditory impairment		
Auditory impairment	3	10.71
No Auditory impairment	25	89.29
Motor disability*		
Paralysis lower limb	8	28.57
Paralysis upper limb	6	21.43
Spasticity	15	53.57
Hypotonia	17	60.71
Not independently mobile	28	100.00

* On this question multiple response options were possible

Table 2
Coding scheme child behaviour

Child behaviour	Examples
Peer directed multiple behaviour	Looking at or turning head or body in the direction of the peer in combination with:
Vocalisations	Screaming
Noises	Tapping on the table
Moving	Moving in the direction of the peer
Gestures	Waving
Facial expression	Smiling
Object related	Looking at the object of the peer
Touching	Touching the peer or the wheelchair of the peer
Combination	Combination of two or more behaviours
Peer directed singular behaviour	
Looking at the peer	Looking at the peer
Vocalisations	Laughing out loud
Noises	Pounding with feet
Moving	Moving in the direction of the peer
Gestures	Pointing
Facial expression	Looking angry,..
Object related	Offering
Touching	Touching the peer or the wheelchair of the peer
Other behaviour	
Directed on the environment	Looking around
Directed towards the support worker	Looking in the direction of the support worker
Directed on the interaction between the support worker and the peer	Looking at the one-on-one interaction
Not alert or sleepy	Looking to themselves, closing the eyes
Insufficient clarity of the video recording	Someone else is in front of the camera

Table 3
Coding scheme for the DSW behaviour

Direct support worker's behaviour	Examples
Distracting behaviour	
Displace a child	Displace a child away from the peers
Displace an object	Displace an object of playing peers
Draw the attention towards the support worker	Calls child's name
Draw the attention towards environment or object	Offering an object to one peer
Other	
Social scaffolding behaviour	
Name social actions	"Give it to An"
Initiate peer play	Facilitating ball throwing
Include a child in a peer group	Interacting with the child, together with a peer
Initiation of proximity	Placing the children into each other's proximity
Communicate about a peer	"Look there is Ben"
Communicate about characteristics of the peer	"Look, An is holding a ball"
Communicate about the feelings of a peer	"I think Ben looks sad"
Other	
Other behaviour	
Insufficient clarity of the video recording	Someone else is in front of the camera
One-on-one interaction	Showing a toy to one child
Recognising peer interactions without reacting	Looking at interacting peers without intervening
Organising the activity	Organising the activity

Table 4
Behaviour of the children with PIMD in without and with DSW and a comparison (% of the time observed)

	Without DSW		With DSW		Comparison			
	Mean (%)	SD (%)	Mean (%)	SD (%)	Difference	z-value	p	effect size r
Singular peer directed behaviour	**18.00**	**17.80**	**3.81**	**4.91**	**-14.19**	**-4.300**	**0.000***	**-0.57**
Vocalisations	0.77	3.36	0.00	0.00	-0.77	-2.521	0.012*	-0.34
Noises	0.10	0.35	0.00	0.00	-0.10	-1.826	0.068	-0.24
Moving	0.02	0.09	0.00	0.00	-0.02	-1.342	0.180	-0.18
Facial expression	0.35	0.95	0.00	0.00	-0.35	-2.521	0.012*	-0.34
Looking at the peer	14.04	17.93	3.52	4.86	-10.52	-3.770	0.000*	-0.50
Object related	0.00	0.00	0.06	0.23	0.06	-1.340	0.180	-0.18
Touching	2.71	5.38	0.23	0.88	-2.48	-2.430	0.020*	-0.32
Gestures	0.01	0.04	0.00	0.00	-0.01	-1.342	0.180	-0.18
Multiple peer directed behaviour	**4.01**	**8.18**	**0.52**	**2.19**	**-3.49**	**-3.840**	**0.000***	**-0.51**
Vocalisations	0.60	1.94	0.02	0.09	-0.58	-2.800	0.010*	-0.37
Noises	0.15	0.46	0.00	0.00	-0.15	-1.604	0.109	-0.21
Moving	0.08	0.29	0.03	0.15	-0.05	-1.600	0.110	-0.21
Facial expression	0.66	1.90	0.03	0.16	-0.63	-2.670	0.010*	-0.36
Object related	0.00	0.00	0.13	0.55	0.13	-1.340	0.180	-0.18
Touching	2.17	7.42	0.31	1.51	-1.86	-2.240	0.030*	-0.30
Combination	0.35	0.91	0.00	0.00	-0.35	-2.666	0.008*	-0.36
Other behaviour	**77.99**	**20.38**	**95.66**	**5.78**	**17.67**	**-4.400**	**0.000***	**-0.59**
Not alert or sleepy	18.86	29.21	2.70	10.43	-16.16	-3.410	0.000*	-0.46
Insufficient clarity of the video recording	1.01	3.64	2.33	5.27	1.32	-1.330	0.180	-0.18
Directed on the environment	58.11	32.15	23.37	14.05	-34.74	-3.960	0.000*	-0.53
Directed towards the support worker	-	-	49.75	18.02	-	-	-	-
Directed on the interaction between the DSW and the peer	-	-	17.52	12.82	-	-	-	-

*p<0.05

Table 5

Conditional probability and Yule's Q of peer directed multiple behaviour following on singular peer directed behaviour and the code 'looking at the peer'

	After singular peer directed behaviour		After looking at the peer	
Second	Conditional probability	Yule's Q	Conditional probability	Yule's Q
1	0.14	0.67	0.11	0.55
2	0.12	0.59	0.09	0.50
3	0.09	0.50	0.07	0.37
4	0.08	0.42	0.06	0.27
5	0.07	0.34	0.05	0.15
6	0.06	0.32	0.05	0.15
7	0.06	0.30	0.04	0.10
8	0.06	0.26	0.05	0.16
9	0.05	0.19	0.04	0.10
10	0.05	0.23	0.05	0.17

Table 6
Behaviour of the DSW

	Mean	SD	Minimum	Maximum
Other behaviour	**97.13**	**2.25**	**91.18**	**99.63**
Organising the activity	33.11	20.36	0.47	72.99
One-on-one interaction	63.98	20.76	22.16	96.30
Recognises peer interactions without reacting	0.03	0.13	0.00	0.48
Distracting behaviour	**0.71**	**1.85**	**0.00**	**6.04**
Distracting by replacing the object	0.12	0.44	0.00	1.66
Displacing an object	0.16	0.59	0.00	220
Draw the attention towards the support worker	0.43	1.61	0.00	6.04
Social scaffolding behaviour	**2.17**	**1.44**	**0.37**	**4.75**
Name social actions	0.51	0.63	0.00	2.30
Include a child in a peer group	0.22	0.60	0.00	2.07
Initiation of proximity	0.15	0.55	0.00	2.06
Communicate about a peer	0.64	1.04	0.00	3.88
Communicate about characteristics of the peer	0.19	0.37	0.00	1.30
Communicate about the feelings of a peer	0.05	0.12	0.00	0.37
Initiate peer play	0.31	0.80	0.00	2.61
Other	0.11	0.41	0.00	1.55

Key messages

- Direct support workers should focus on singular as well as multiple peer directed behaviours when supporting children with PIMD during peer interactions.
- More knowledge is needed on the effectiveness of various social scaffolding behaviours of DSW.
- The definition of peer directed behaviours in persons with PIMD needs to be adapted by including singular peer directed behaviours.